

In the Claims

The following is a complete listing of the claims and replace all prior claims in the application:

- 1 1. (currently amended) A magnetic tunnel junction device, comprising:
2 a first magnetic layer and a second magnetic layer, at least one of the first and the second
3 magnetic layers configured to include diffusion components selected to adjust one or more
4 properties of the tunnel junction device; and
5 a barrier layer disposed between the first and the second magnetic layers comprising
6 diffusion components from the at least one magnetic layer, wherein the diffusion components
7 form a concentration gradient by migrating from an area of higher concentration of diffusion
8 components in the at least one magnetic layer to an area of lower concentration of diffusion
9 components within the barrier layer, the concentration gradient of the diffusion components in
10 the barrier layer adjust adjusting the one or more properties of the tunnel junction device.
- 1 2. (original) The device of claim 1, wherein the diffusion components are selected
2 to reduce a series resistance of the barrier layer.
- 1 3. (original) The device of claim 1, wherein the diffusion components are selected
2 to decrease a bandgap of the barrier layer.
- 1 4. (original) The device of claim 1, wherein the diffusion components are selected
2 to passivate an interface of the barrier layer.
- 1 5. (original) The device of claim 1, wherein:
2 the first magnetic layer is a pinned magnetic layer; and
3 the second magnetic layer is a free magnetic layer.
- 1 6. (original) The device of claim 1, wherein at least one of the first and the second
2 magnetic layers is a multi-layer structure.

1 7. (currently amended) The device of claim 1, wherein ~~the at least one layer~~ at least
2 one of the first and the second magnetic layers comprises an alloy of CoFe.

1 8. (original) The device of claim 7, wherein the alloy of CoFe comprises CoFeHf.

1 9. (original) The device of claim 8, wherein the CoFeHf comprises about 5 to about
2 10 atomic percent Hf.

1 10. (original) The device of claim 7, wherein the alloy including CoFe comprises
2 CoFeZr.

1 11. (original) The device of claim 10, wherein the CoFeZr comprises about 5 to
2 about 10 atomic percent Zr.

1 12. (original) The device of claim 1, wherein the diffusion components comprise Hf.

1 13. (original) The device of claim 1, wherein the diffusion components comprise Zr.

1 14. (canceled)

1 15. (original) The device of claim 1, wherein the barrier layer including the migrated
2 diffusion components comprises AlHfO_x.

1 16. (original) The device of claim 1, wherein the barrier layer including the migrated
2 diffusion components comprises AlZrO_x.

1 17. (currently amended) A magnetic tunnel junction sensor, comprising:

2 a magnetic tunnel junction device comprising:

3 a first magnetic layer and a second magnetic layer, at least one of the first and the
4 second magnetic layers configured to include diffusion components selected to adjust one
5 or more properties of the tunnel junction device; and

6 a barrier layer between the first and the second magnetic layers, the barrier layer
7 comprising diffusion components from the at least one magnetic layer, wherein the
8 diffusion components form a concentration gradient by migrating from an area of higher
9 concentration of diffusion components in the at least one magnetic layer to an area of
10 lower concentration of diffusion components within the barrier layer, the concentration
11 gradient of the diffusion components in the barrier layer adjust adjusting the one or more
12 properties of the tunnel junction device;

13 a current source coupled to the first magnetic layer and the second magnetic layer; and

14 a magnetoresistance detector, coupled to the first and the second magnetic layers, for
15 detecting an electrical resistance through the magnetic tunnel junction device based on magnetic
16 orientations of the first and the second magnetic layers.

1 18. (original) The device of claim 17, wherein the diffusion components are selected
2 to reduce a series resistance of the barrier layer.

1 19. (original) The device of claim 17, wherein the diffusion components are selected
2 to decrease a bandgap of the barrier layer.

1 20. (original) The device of claim 17, wherein the second magnetic layer is a free
2 magnetic layer.

1 21. (original) The device of claim 17, wherein the first magnetic layer is a pinned
2 multi-layer magnetic structure.

1 22. (original) The device of claim 17, wherein the first magnetic layer comprises an
2 alloy of CoFe.

1 23. (currently amended) The device of claim [[17]] 22, wherein the alloy of CoFe
2 comprises CoFeHf.

1 24. (currently amended) The device of claim [[17]] 22, wherein the alloy of CoFe
2 comprises CoFeZr.

1 25. (original) The device of claim 17, wherein the diffusion components comprise
2 Hf.

1 26. (original) The device of claim 17, wherein the diffusion components comprise Zr.

1 27. (canceled)

1 28. (original) The device of claim 17, wherein the barrier layer including the
2 migrated diffusion components comprises AlHfO_x.

1 29. (original) The device of claim 17, wherein the barrier layer including the
2 migrated diffusion components comprises AlZrO_x.

1 30. (currently amended) A magnetic storage system, comprising:
2 a movable magnetic recording medium;
3 a magnetic tunnel junction sensor for detecting magnetic signals on the moveable
4 recording medium, comprising:
5 a first magnetic layer and a second magnetic layer, at least one of the first and the
6 second magnetic layers configured to include diffusion components selected to adjust one or
7 more properties of the tunnel junction sensor;
8 a barrier layer between the first and the second magnetic layers, the barrier layer
9 including diffusion components from the at least one magnetic layer, wherein the diffusion
10 components form a concentration gradient by migrating from an area of higher concentration of
11 diffusion components in the at least one magnetic layer to an area of lower concentration of
12 diffusion components within the barrier layer, the concentration gradient of the diffusion
13 components in the barrier layer adjust adjusting the one or more properties of the tunnel junction
14 device; and
15 a magnetoresistance detector, coupled to the first and the second magnetic layers,
16 for detecting an electrical resistance through the magnetic tunnel junction sensor based on
17 magnetic orientations of the first and the second magnetic layers; and
18 an actuator, coupled to the magnetic tunnel junction sensor, for moving the sensor
19 relative to the medium.

1 31. (original) The device of claim 30, wherein the at least one of the first and the
2 second magnetic layers comprises an alloy of CoFe.

1 32. (original) The device of claim 31, wherein the alloy of CoFe comprises CoFeHf.

1 33. (original) The device of claim 31, wherein the alloy of CoFe comprises CoFeZr.

1 34. (original) The device of claim 30, wherein the diffusion components comprise
2 Hf.

1 35. (original) The device of claim 30, wherein the diffusion components comprise Zr.

1 36. (original) The device of claim 30, wherein the barrier layer including the
2 migrated diffusion components comprises AlHfO_x .

1 37. (original) The device of claim 30, wherein the barrier layer including the
2 migrated diffusion components comprises AlZrO_x .

1 38. (currently amended) A memory device, comprising:
2 an array of memory elements configured to store information for later access, each
3 memory element comprising:
4 a first magnetic layer and a second magnetic layer, at least one of the first and the
5 second magnetic layers configured to include diffusion components selected to adjust one or
6 more properties of the memory element; and
7 a barrier layer between the first and the second magnetic layers, the barrier layer
8 comprising diffusion components from the at least one magnetic layer, wherein the diffusion
9 components form a concentration gradient by migrating from an area of higher concentration of
10 diffusion components in the at least one magnetic layer to an area of lower concentration of
11 diffusion components within the barrier layer, the concentration gradient of the diffusion
12 components in the barrier layer adjust adjusting the one or more properties of the tunnel junction
13 device.

1 39. (currently amended) A tunnel junction device, comprising:
2 means for providing a first magnetic layer incorporating diffusion components
3 selected to adjust one or more properties of the tunnel junction device;
4 means for providing a second magnetic layer;
5 means for providing a tunnel barrier layer between the first and the second
6 magnetic layers, the tunnel barrier layer including diffusion components from the first magnetic
7 layer, wherein the diffusion components form a concentration gradient by migrating from an area
8 of higher concentration of diffusion components in the at least one magnetic layer to an area of
9 lower concentration of diffusion components within the barrier layer, the concentration gradient
10 of the diffusion components in the barrier layer adjust adjusting the one or more properties of the
11 tunnel junction device.

1 40. (currently amended) A magnetic tunnel junction sensor, comprising:
2 means for providing a first magnetic layer configured to include diffusion components
3 selected to adjust one or more properties of the tunnel junction sensor; and
4 means for providing a second magnetic layer;
5 means for providing a barrier layer between the first and the second magnetic layers, the
6 barrier layer comprising diffusion components from the first magnetic layer, wherein the
7 diffusion components form a concentration gradient by migrating from an area of higher
8 concentration of diffusion components in the at least one magnetic layer to an area of lower
9 concentration of diffusion components within the barrier layer, the concentration gradient of the
10 diffusion components in the barrier layer adjust adjusting the one or more properties of the
11 tunnel junction device; and
12 means for measuring an electrical resistance through the first and the second magnetic
13 layers and the barrier layer based on magnetic orientations of the first and the second magnetic
14 layers.

1 41. (currently amended) A magnetic storage system, comprising:
2 means for storing magnetic data;
3 means for sensing the magnetically stored data, comprising:
4 means for providing a first magnetic layer configured to include diffusion
5 components selected to alter one or more properties of the sensing means;
6 means for providing a second magnetic layer; and
7 means for providing a barrier layer between the first and the second magnetic
8 layers, the barrier layer including diffusion components ~~from the first magnetic layer and~~
9 ~~altering the one or more properties~~ form a concentration gradient by migrating from an
10 area of higher concentration of diffusion components in the at least one magnetic layer to
11 an area of lower concentration of diffusion components within the barrier layer, the
12 concentration gradient of the diffusion components in the barrier layer adjusting the one
13 or more properties; and
14 means for detecting an electrical resistance through the means for sensing based
15 on magnetic orientations of the first and the second magnetic layers; and
16 means for moving the means for sensing relative to the means for magnetic data ~~storage~~
17 storage.